

**REMARKS**

This is in response to the Office Action that was mailed on September 25, 2006. Claims 1-14 are pending in the application.

THE INVENTION. The present invention provides a method for estimating a NO<sub>x</sub> occlusion amount of a NO<sub>x</sub> occlusion catalyst interposed in an exhaust passage in an engine. The method of this invention includes the steps of: (A.) estimating said NO<sub>x</sub> occlusion amount using a polynomial reflected with a NO<sub>x</sub> occlusion characteristics of said NO<sub>x</sub> occlusion catalyst, and (B.) correcting each coefficient of said polynomial sequentially on the basis of NO<sub>x</sub> purification rates actually measured.

Claims 1, 6, and 11-13 were rejected under 35 U.S.C. § 102(e) as being anticipated by US 6,826,902 (Sun). Office Action, pages 2-4. Claims 2-4 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sun in view of US 2005/0261397 (Yang). Office Action, pages 4-5. Claims 2-4 and 7-10 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sun in view of US 2005/0261397 (Yang). Office Action, pages 4-5 and 6-7. Claim 5 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Sun in view of Yang and "official notice". Office Action, page 6. Claim 14 was rejected under 35 U.S.C. § 103(a) as being unpatentable over Sun in view of "official notice". Office Action, pages 7-8. All of these rejections are respectfully traversed.

Sun fails to teach or suggest a step of correcting each coefficient of the polynomial sequentially on the basis of NO<sub>x</sub> purification rates actually measured, which is a significant feature of the present invention. Therefore, the Sun technology is very different from the technology of the present application.

Sun indicates that "coefficients c1 and c2 are determined from experimental data". Column 8, lines 6-7. There is no description or suggestion that these coefficients are determined or corrected sequentially on the basis of NO<sub>x</sub> purification rates actually measured. Accordingly, the rejection of claim 1 as being anticipated is clearly erroneous.

Regarding claim 6, although the Examiner points out an equation (4b), it is an equation (4b) for calculating an NO<sub>x</sub> occlusion rate X<sub>a</sub> of NO<sub>x</sub> and has no relationship to claim 6 in this application which is concerned with calculating an NO<sub>x</sub> discharging amount. In addition, because equation (4a) discloses an equation calculating the desorption rate X<sub>d</sub> of NO<sub>x</sub>, equation (4a) is closer to the art than equation (4b). In this point, equation (4a) is  $x_a = C_1 X_{NO_x}$ , and X<sub>NO<sub>x</sub></sub> represents the amount of stored NO<sub>x</sub>. Therefore, equation (4a) indicates only that the desorption rate of NO<sub>x</sub> is proportional to the amount of stored NO<sub>x</sub> occluded NO<sub>x</sub> trap catalyst. In contrast, the invention of present claim 6 calculates an NO<sub>x</sub> discharging amount from catalyst inlet reducing agent concentration, reducing agent utilization rate, oxygen concentration in catalyst inlet, and exhaust gas flow rate. This innovative calculation is neither taught nor suggested by the Sun reference.

Regarding claim 11, The Examiner argues that in lines 38-41 of column 3 Sun discloses that "the engine is constituted such that switching can be performed between a lean operation where an exhaust gas air-fuel ratio is lean and a rich operation where the exhaust gas air-fuel ratio is rich". However, an important part of claim 11 – which is "the coefficients of the polynomial are held during the rich operation, and when a difference between the NO<sub>x</sub> purification rate obtained by using the held coefficients at the starting time of the lean operation and the NO<sub>x</sub> purification rate actually measured is equal to or more than a threshold value, the NO<sub>x</sub> occlusion amount is corrected – is not disclosed in Sun.

In the Office Action, the Examiner argues that in Sun, coefficients c1 and c2 are based on experimental data and are corrected based on a measured changed of NO<sub>x</sub> adsorption or desorption rates. However, there is no disclosure or suggestion that coefficients c1 and c2. are corrected during the engine operation. Even if "coefficients c<sub>1</sub> and c<sub>2</sub> are corrected based on NO<sub>x</sub> adsorption or desorption rates", Sun fails to disclose or suggest the art that "said coefficients of the polynomial are held during said rich operation, and when a difference between the NO<sub>x</sub> purification rate obtained by using said held coefficients at a starting time of the lean operation and said NO<sub>x</sub> purification rate actually measured is equal to or more than a threshold value, said NO<sub>x</sub> occlusion amount is corrected", as in the present application.

Regarding claims 12 and 13, the Examiner argues that Sun shows "the NO<sub>x</sub> occlusion amount is corrected, when a difference between an actually measured value of the NO<sub>x</sub> purification rate ( $x_a, x_d$ ) at the starting time of the lean operation of said engine and an estimated value thereof is equal to or more than a threshold value" and "a NOx occlusion amount calculated at the starting time of the lean operation is incorrect, when a difference between said NOx purification rate estimated by the polynomial and the NOx purification rate ( $x_a, x_d$ ) obtained by actual measurement immediately after switching is performed from the rich operation of said engine to the lean operation thereof is equal to or more than a predetermined value". However, Applicants respectfully submit that Sun does not actually disclose or suggest these points.

Regarding claim 2-4, 5, 7-10, and 14, Yang discloses that an NO<sub>x</sub> occlusion amount occluded in an NO<sub>x</sub> catalyst is obtained based on exhaust gas temperature, exhaust gas velocity, and flow rates of NO<sub>x</sub>. However, Yang does not disclose the use of a NO<sub>x</sub> purification rate  $r$  as in claim 2 in this application. The Examiner contends that using the well-known method of least square, is obvious. However, because claim 4 is unobvious over Sun and Yang as pointed out above, however, all of the dependent claims herein should be allowed. Furthermore, for instance, there is no disclosure nor suggestion in any of the prior art cited by the Examiner that "the reducing agent utilization rate is set on the basis of the exhaust gas temperature  $y$  and the exhaust gas flow velocity  $z$ , and at the same time the characteristics of the reducing agent utilization rate are stored in a reducing agent utilization rate setting map", which is required by claim 7 in this application.

In view of the above discussion, Applicants believe that the pending application is in condition for allowance.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Richard Gallagher (Reg. No. 28,781) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

Application No. 10/807,236  
Amendment dated December 26, 2006  
Reply to Office Action of September 25, 2006

Docket No.: 1602-0184PUS1

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37.C.F.R. §§1.16 or 1.14; particularly, extension of time fees.

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Respectfully submitted,

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